The Difference that Makes a Difference: Distinguishing Between Knowledge Management and Information Management in the U.S. Army

A Monograph

by

MAJ Patrick K Sullivan

US Army

School of Advanced Military Studies

United States Army Command and General Staff College

Fort Leavenworth, Kansas

AY 2010-2011

Approved for Public Release; Distribution is Unlimited

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	6 May 2011	July 2010 – May 2011

4. TITLE AND SUBTITLE
The Difference that Makes a Difference: Distinguishing Between Knowledge Management and Information Management in the U.S. Army

5. FUNDING NUMBERS

6. AUTHOR(S)
Major Patrick K. Sullivan, United States Army

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

School of Advanced Military Studies
250 Gibbon Ave
Fort Leavenworth, KS 66027

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for Public Release; Distribution is Unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT ***(Maximum 200 Words)***

In today's interconnected society there has been a push for the use of technology to increase the speed of information blurring the distinction between knowledge and information. This monographs illustrates the issues with knowledge and the common misconceptions that the United States Army is experiencing with Knowledge Management as an emerging concept. Knowledge Management has been introduced into doctrine over the past five years; however the concepts are being confused and causing issues in understanding of what knowledge and information management encompass.

The terminology for information and knowledge in doctrine is not consistent which causes the words to be used without precision. Additionally, the Army is trying to grapple with the changing hierarchical structure to one of a networked hierarchy, through modularity, further causing confusion. The importance of knowledge management is the human processes that facilitate the transfer of knowledge in the current and future cultures. Knowledge management is not a specific system or piece of technology, it is a human process.

14. SUBJECT TERMS
Information Management, Knowledge Management, Culture, Doctrine, Theory of Knowledge, NUCOR Case Study, Learning Organization

15. NUMBER OF PAGES
52

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
(U)	(U)	(U)	(U)

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

Major Patrick Kim Sullivan

Title of Monograph: The Difference that Makes a Difference: Distinguishing Between Knowledge Management and Information Management in the U.S. Army

Approved by:

_____ Monograph Director
Alexander J. Ryan, Ph.D.

_____ Second Reader
Bruce E. Stanley

_____ Director,
Wayne W. Grigsby, Jr., COL, IN School of Advanced Military Studies

_____ Director,
Robert F. Baumann, Ph.D. Graduate Degree Programs

Disclaimer: Opinions, conclusions, and recommendations expressed or implied within are solely those of the author, and do not represent the views of the US Army School of Advanced Military Studies, the US Army Command and General Staff College, the United States Army, the Department of Defense, or any other US government agency. Cleared for public release: distribution unlimited.

Abstract

The Difference that Makes a Difference: Distinguishing Between Knowledge Management and Information Management in the U.S. Army by MAJ Patrick K. Sullivan, US Army, 49 pages.

In today's interconnected society there has been a push for the use of technology to increase the speed of information blurring the distinction between knowledge and information. This monographs illustrates the issues with knowledge and the common misconceptions that the United States Army is experiencing with Knowledge Management as an emerging concept. Knowledge Management has been introduced into doctrine over the past five years; however the concepts are being confused and causing issues in understanding of what knowledge and information management encompass.

The terminology for information and knowledge in doctrine is not consistent which causes the words to be used without precision. Additionally, the Army is trying to grapple with the changing hierarchical structure to one of a networked hierarchy, through modularity, further causing confusion. The importance of knowledge management is the human processes that facilitate the transfer of knowledge in the current and future cultures. Knowledge management is not a specific system or piece of technology, it is a human process.

Table of Contents

Introduction

> Be, ***Know***, Do. It is critical that Army leaders be agile, multiskilled *pentathletes* who have strong moral character, broad knowledge, and keen intellect.
>
> —Peter J Schoomaker, Foreword to *FM 6-22 Army Leadership*

The United States Army places an emphasis on knowledge with many sayings such as Be, Know, Do. Knowledge is imperative for understanding in any area of study. Knowledge provides the understanding for an Army professional to be competent. "Leaders apply this knowledge within a spectrum of established competencies to achieve successful mission accomplishment."[1] "Knowledge shapes a leader's identity and is reinforced by a leader's actions."[2] If knowledge is critical to leadership then how does the United States Army take knowledge and manage it so that it can be transferred to others to inform and influence? The United States Army understands the need to manage knowledge and has begun to implement doctrine and policy; however, the culture in the Army hinders change, the doctrine is not being followed, and the means to implement knowledge management is based on systems as opposed to human interaction.

In today's interconnected society where information flows freely and rapidly between actors, how does a leader process this information into useable knowledge? What is the knowledge that a leader needs to make informed decisions? Where can the information be found and how reliable is the information? The U.S. Army has struggled with all of these questions of knowledge management during the last decade at war. The question that must first be asked before these questions can be addressed is: what is knowledge?

Knowledge is difficult to define and has caused debate for many millennia. The process by which one acquires knowledge, what knowledge is, and the aspects of knowledge, is encompassed in the study of epistemology, or the theory of knowledge. Coming to understand

[1] U.S. Army, *FM 6-22 Army Leadership* (Washington D.C.: U.S. Army, 2006), 1-1.

[2] Ibid.

there are many thoughts on the theory of knowledge allows an understanding of why knowledge management is a complex topic and not easily shaped into a checklist to transfer knowledge.

Knowledge is therefore defined by the Army in *FM 6-01.1 Knowledge Management Section* as "Information analyzed to provide meaning and value or evaluated as to implications for the operation. It is also comprehension gained through study, experience, practice, and human interaction that provides the basis for expertise and skilled judgment." This definition is as good as any and drives an understanding in the Army culture of what knowledge should be. In order to understand this definition properly then one must understand what the Army considers information. "1. In the general sense, the meaning humans assign to data. 2. In the context of the cognitive hierarchy, data that have been processed to provide further meaning."[3] So key to information is the ability to apply meaning to data, which is defined as "unprocessed signal communicated between any nodes in an information system, or sensings from the environment detected by a collector of any kind (human, mechanical, or electronic)."[4] Knowledge management is the means by which the military is trying to take data and apply meaning, then apply analysis to get knowledge.

Army doctrine is a means by which knowledge from people (tacit knowledge) is then codified to become the institutional knowledge (explicit knowledge). The Army doctrine defines knowledge management as:

> The art of creating, organizing, applying, and transferring knowledge to facilitate situational understanding and decision making. Knowledge management supports improving organizational learning, innovation, and performance. Knowledge management processes ensure that knowledge products and services are relevant, accurate, timely, and useable to commanders and decision makers.[5]

There has been a push for knowledge management in Army doctrine since the turn of the millennium. The change in doctrine is reflected in the capstone manuals of *Field Manual (FM) 1-*

[3] U.S. Army, *FM 6-01.1 Knowledge Management Section* (Washington D.C.: U.S. Army, 2008), Gossary-2.

[4] U.S. Army, *FM 6-0 Missions Command* (Washington D.C., U.S. Army, 2003), Glossary-5.

[5] U.S. Army, *FM 3-0 Operations* (Washington DC: U.S. Army, 2008), Glossary-9.

0 The Army and *FM 3-0, Operations* as well as key Army manuals *FM 5-0, The Operations Process, FM 6-0 Mission Command,* and *FM 6-22 Army Leadership.* The Army released *FM 6-01.1 Knowledge Management Section* in August, 2008 as the first knowledge management doctrine to try address the issue of managing knowledge. Unfortunately, the doctrine of knowledge management being released in different manuals at different times has confused many on what knowledge management is supposed to be. The key to knowledge management is the ability for humans to transfer knowledge to others in order to get the right knowledge to the right place at the right time.

Human interaction is the key to managing knowledge. The reason for knowledge is so that the military professional can take informed action towards a purpose. The United States Army has used technology to help drive the process of transferring knowledge, but the information systems that were supposed to help the process have become the process. Knowledge management through the use of human interaction, processes, and technology is the means the Army would like to manage and transfer knowledge; however when the tool (technology) becomes the process then there is a critical breakdown in the knowledge management system.

The breakdown can be found in an Army culture that is dependent on technology. This culture in 2006 had 36 different programs of record (information systems) managed by 26 different companies that were intended to help transfer information encapsulated in the Army Battle Command Systems concept. Knowledge management is the art of creating, organizing, applying, and transferring knowledge to facilitate situational understanding and decision-making; therefore, commanders and staffs assess knowledge management effectiveness by whether it leads to better decisions.

> Change and adaptation that once required years to implement must now be recognized, communicated, and enacted far more quickly. Technology played an increasingly important role in increasing lethality on twentieth century battlefields. Now it is assuming more importance and will require greater and more rapid innovation in tomorrow's conflicts. No longer can the Army take months to respond to hostile, asymmetric

> approaches. Solutions must be disseminated across the force in weeks—and then adapted quickly and innovatively as the enemy adapts to counter the newfound advantages.[6]

The human (commander and staff) aspect of knowledge management must develop processes (SOPS, TTPS, Doctrine) to transfer knowledge through tools (information systems, technology) in order to rapidly and more effectively inform the force.

Methodology

The monograph is broken down into three sections: theory, doctrine, and application, followed by the conclusion and recommendations.

The theory section highlights basic theory of knowledge and differing views on what knowledge is. Epistemology can be traced back to Plato's seminal work on knowledge, *Theaetetus*. Contemporary authors have also struggled with knowledge and what it is. Polyani coined the term of tacit knowledge for the private knowledge known to each person. The means by which knowledge is formed, used, and passed on is influenced by culture. Finally, a particularly effective means of knowledge transfer within and between organizations is through communities of practice.

The doctrine section analyzes what the codified (explicit) knowledge is in the United States Army concerning Knowledge Management. *FM 3-0 Operations,* being one of two Army capstone manuals, is looked at in depth, for that is the key to understanding or misunderstanding of knowledge management in the Army. *FM 5-0 The Operations Process* gives the detail on how the Army is to plan, prepare, and execute operations and it is vital to understand how knowledge is to facilitate those processes. *FM 6-0 Mission Command* is the primary Army manual that lays out the cognitive hierarchy, which differentiates between data, information, knowledge, and understanding. *FM 6-01.1 Knowledge Management Section* is the only Army doctrine that speaks about Knowledge Management in detail.

[6] U.S. Army, *FM 7-0 Full Spectrum Training* (Washington D.C.: U.S. Army, 2010), 1-5.

The application section explores how knowledge management is conducted in a Fortune 500 company, NUCOR. Additionally, interviews with active members of the United States Army provides insight into how Army leaders see knowledge management and how it is being employed in the force.

Knowledge Management Theory

Understanding knowledge management requires understanding the theoretical concepts of knowledge. In this section the first concept is epistemology: "theory of knowledge, especially with regard to its methods, validity, and scope."[7] Next, an understanding of how culture influences knowledge and then knowledge management is developed. Last, the use of communities of practice as a theory of knowledge transfer is examined.

Theory of Knowledge

What is knowledge? This is a question that has been asked for millennia. Plato wrote *Theaetetus* in 360 BC, which is a dialogue about the question of what is knowledge. The dialogue is between the actors Socrates and Theaetetus, however this was written by Plato and was after Socrates' death. Theaetetus answers Socrates question of what is knowledge four times and four times Socrates proves that knowledge is not what Theaetetus thinks it is. The first instance Theaetetus says knowledge is something a professional makes and Socrates uses clay as an example of how not to define a term with the use of what is made from that item.

> What is clay? And we were to reply, that there is a clay of potters, there is a clay of oven-makers, there is a clay of brick-makers; would not the answer be ridiculous? In the first place, there would be an absurdity in assuming that he who asked the question would understand from our answer the nature of "clay," merely because we added "of the image-makers," or of any other workers. How can a man understand the name of anything, when he does not know the nature of it?[8]

---

[7] *Oxford Dictionary*, "Epistemology," http://oxforddictionaries.com/view/entry/m_en_us1244556#m_en_us1244556 (Accessed November 16, 2010).

[8] Plato, "Theaetetus," MIT.edu, http://classics.mit.edu/Plato/theatu.html (accessed November 10, 2010).

The next answer Theaetetus gives is that knowledge is perception and Socrates again rebuts this argument by asking a question as simple as can one man perceive something as hot and another as cold. Theaetetus' next answer is the first answer that Socrates acknowledges as close to a possible answer and it is that knowledge is true belief. The problem with true belief is that Socrates is unable to develop a satisfactory account of false belief. Theaetetus' final answer is that knowledge is justified true belief, or true belief that has some kind of judgment applied. Socrates points out this is closest to what knowledge may be but then asks what counts as justification. This leads to an *aporia* or an impasse.[9] The question still remains: what is knowledge? Epistemology is the study of knowledge, and more importantly what is the nature of knowledge and what justifies as knowledge.

In the book *Epistemology: A Contemporary Introduction to the Theory of Knowledge*, Robert Audi contends that: "The main focus is the body of concepts, theories, and problems central in understanding knowledge and justification. Historically justification – sometimes under such names as 'reason to believe', 'evidence', and 'warrant' – has been as important in epistemology as knowledge itself."[10] The author starts with perception, then justification and finally, goes into detail on what justification is needed to explain knowledge, which relates back to the dialogue between Theaetetus and Socrates of what is knowledge.

Matthias Steup of Purdue University states:

> Epistemology is the study of knowledge, epistemology is concerned with the following questions: What are the necessary and sufficient conditions of knowledge? What are its sources? What is its structure, and what are its limits? Understood more broadly, epistemology is about issues having to do with the creation and dissemination of knowledge in particular areas of inquiry.[11]

---

[9] Ibid.

[10] Robert Audi, *Epistemology: A Contemporary Introduction to the Theory of Knowledge* (London: Routledge, 1997), 12.

[11] Matthias Steup, "Epistemology", *The Stanford Encyclopedia of Philosophy (Spring 2010 Edition)*, Edward N. Zalta (ed.), http://plato.stanford.edu/archives/spr2010/entries/epistemology (accessed October 23, 2010), 4.0

The questions of epistemology are important, not because there is an answer, but as a means of understanding and a point from which to look at information and then gain knowledge from that information. Military practitioners need not understand the philosophy of epistemology; however, they should appreciate that there is an entire field dedicated to understanding what constitutes knowledge and how knowledge is created and passed on to others.

Steup highlights a few keys areas that are integral in understanding the sources of knowledge. The three areas of perception, introspection, and memory highlight what shapes the context of the knowledge and how important that context is. "We take our perceptual faculties to be reliable. But how can we know that they are reliable?"[12] Perception is raw data that is being processed by the mind. "Introspection reveals how the world appears to us in our perceptual experiences."[13] The introspection is data that has processed to create information. "Memory is the capacity to retain knowledge acquired in the past. One issue about memory concerns the question of what distinguishes memorial seemings from perceptual seemings or mere imagination."[14] Finally, analyses of that information, through the memory, leads to knowledge. The understanding of knowledge is shaped through the perception and introspection of an individual and then resides in that memory to be passed on. The next question then is what is knowledge?

In the cognitive realm, knowledge is information that has been processed and learned (tacit) or is codified (explicit) in a field of study. Explicit knowledge "is knowledge codified and digitized in books (doctrine), documents, reports, white papers, spreadsheets, memos, training courses, and the like."[15] Explicit knowledge is taught through means of training, education, and reading. This body of knowledge should be easier to understand and identify since it is

[12] Ibid., 4.1.

[13] Ibid., 4.2

[14] Ibid., 4.3

[15] Elias M Awad and Hassan M. Ghaziri, *Knowledge Management*, United States ed. (Upper Saddle River, N.J.: Prentice Hall, 2003), 47.

measureable and distributable.[16] The act of transmitting the codified knowledge is still difficult based on the amount of knowledge available to attain; however, the more difficult facet is tacit knowledge.

"Tacit knowledge is knowledge embedded in the human mind through experience and jobs."[17] Michael Polanyi stated:

> This conception of knowledge as personal knowing departs in two closely related respects from the ideal of a strictly justifiable knowledge. It accredits man's capacity to acquire knowledge even though he cannot specify the grounds of his knowing, and it accepts the fact that his knowing is exercised within an accidentally given framework that is largely unspecifiable.[18]

Polanyi is addressing the same issues that Plato raised in *Theaetetus* of how do we know what knowledge is and what is the perception and justification of that knowledge. However, his claim that knowledge can be valid even when the knower is unable to fully explain or justify how they know something is novel. Tacit knowledge is personal knowledge, but must be transferred to others for it to be useful to the organization.

Donald Schön uses a theory of knowing-in-action and reflecting in action to highlight a means to teach others what we know. Knowing-in-action is revealed "by our spontaneous, skillful execution of the performance; and we are characteristically unable to make it verbally explicit."[19] Schön elaborates that "we may reflect on action, thinking back on what we have done in order to discover how our knowing-in-action may have contributed to an unexpected outcome."[20] Reflection-in-action is a process that requires self-reflection and preferably an expert practitioner to guide a student along the path of learning. The learning takes time and is very intensive, which will be problematic if the goal is to impart knowledge on many to ensure shared understanding. Passing on tacit knowledge leads to the larger question for the Army of how to coach and learn in

[16] Ibid., 47.

[17] Ibid., 47.

[18] Michael Polanyi, "Knowing and Being," Mind 70, no. 280 (October 1961): 468.

[19] Donald A. Schon, *Educating the Reflective Practitioner* (San Francisco: Jossey-Bass, 1990), 25.

[20] Ibid., 26.

the field or somewhere other than an academic environment. This requires a cultural shift to facilitate knowledge transfer.

Culture's Influence on Knowledge

The key to understanding culture lies in an understanding of what motivates thought and action and how the culture is structured.

> Culture is learned, shared by members of a society, patterned, changeable, arbitrary, and internalized, in the sense that it is habitual, taken for granted, and perceived as "natural" by people in the society. Culture conditions the individual's range of action and ideas, including what to do and not do, how to do or not do it, and whom to do it with or not to do it with. Culture also includes under what circumstances the "rules" shift and change. Culture influences how people make judgments about what is right and wrong, assess what is important and unimportant, categorize things, and deal with things that do not fit into existing categories. Cultural rules are flexible in practice.[21]

Edgar Schein, who writes on organizational culture, defined culture as:

> The culture of a group can now be defined as a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems.[22]

The definitions from United States Army Doctrine and Schein are consistent in that groups or societies have shared beliefs, patterns, and assumptions that create a way of thinking and acting within these social groups. Schein elaborates that there are three levels of culture: Artifacts (visible and feelable structures and process), espoused beliefs and values (strategic goals and philosophies), and underlying assumptions (unconscious, taken-for-granted beliefs, perceptions, thoughts and feelings).[23] Unfortunately, the most visible aspect of any organization

[21] U.S. Army, *FM 3-24.2 Tactics in Counterinsurgency* (Washington D.C.: U.S. Army, 2009), 1-19.

[22] Edgar H. Schein, *Organizational Culture and Leadership* (J-B US non-Franchise Leadership), 3 ed. (San Francisco: Jossey-Bass, 2004), 18.

[23] Ibid., 26.

is the artifacts but understanding of them is not possible unless there is an understanding of the underlying assumptions inherent in the organization.[24]

The artifacts of the United States Army are the processes and the structure. The structure is what Max Weber would term as a Bureaucracy. "Bureaucratic administration means fundamentally domination through knowledge."[25] According to Mary Jo Hatch, "[t]he ideal bureaucracy that Weber imagined was a means for turning employees [soldiers] of average ability into rational decision makers serving their clients [American people] with impartiality and efficiency."[26] This model has three components: the division of labor, the hierarchy of authority and formalized rules and procedures.[27] It is well known that the United States Army is a hierarchical system which lends to a "top down" approach in leadership and management of personnel and resources; further the military is governed by formalized rules (uniformed code of military justice, law, mandates) and established procedures (doctrine, standard operating procedures, command guidance) that govern the conduct and action of personnel.

Hatch states that "formalization tends to reduce the amount of discretion employees have in performing their work tasks while increasing the sense of control managers maintain over their employees."[28] Centralized leadership is critical to ensuring the execution of missions based on formalized rules and procedures; however, this also fosters a culture that is resistant to change. To comprehend the structure there must be comprehension then of the underlying assumptions. William Ouchi writing on bureaucracies spoke about clan hierarchies:

> A clan is a culturally homogeneous organization, one in which most members share a common set of values or objectives plus beliefs about how to coordinate effort in order to reach common objectives. The clan functions by socializing each member completely so

[24] Ibid., 36.

[25] Max Weber, *Economy and Society: An Outline of Interpretive Sociology (2 volume set)*, ed. Guenther Roth and Claus Wittich (Berkeley: University of California Press, 1978), 225.

[26] Mary Jo Hatch, *Organization Theory: Modern, Symbolic, and Postmodern Perspectives, 2 ed*. (New York: Oxford University Press, USA, 2006), 103.

[27] Ibid., 103.

[28] Ibid., 105.

> that each merges individual goals with the organizational ones, thus providing them with the motivation to serve the organization. The merged goals socialize the individuals completely and provide them with information on the best way to get things done, thus making this decision-making process almost instinctual.[29]

The United States Army's hierarchy and culture are formed by this clan mentality. When a member enters the service, enlisted, officer, or civilian, they undergo an indoctrination of the shared values and beliefs. The shared values and beliefs are at the core of how our Army operates but it is also the reason change is so slow. In an article titled "Recognizing the Army's Cultural Change" Major General Edward Cardon stated: "This is not about branch or specialty, but about skill set; not about rank, but about capability. More than not understanding the changing culture, leaders who focus on the former tend to frustrate our junior leaders. On the other hand, leaders who can harness our changing Army culture will continue to ensure that our Army remains the most respected land force in the world."[30] Major General Cardon recognizes a change in the culture from a purely hierarchical structure to one that is a combination of a network and a hierarchy.

The networked form of sharing has led the military to an understanding that every soldier and leader may have a strategic impact. Leaders do not have the means to control information they used to have because of the speed at which information now flows. General Cardon states that this information sharing and the current operating environment, such as Iraq and Afghanistan, have led soldiers to transition from their formalized training to skill sets and capabilities. "Transformation and war have forces our soldiers to develop a culture of near continuous adaptation, innovation, and improvement."[31] The shift in the army values from uniformity and control to more skill set and capabilities will continue to evolve.

---

[29] William G. Ouchi and Raymond L. Price, "Hierarchies, Clans, and Theory Z: A New Perspective On Organization Development," Organization Dynamics 7, no. 2 (1978): 36, http://www.ebscohost.com (accessed December 9, 2010).

[30] Edward Cardon, "Recognizing the Army's Cultural Changes," *ARMY Magazine* (July 2007): 15.

[31] Edward Cardon, "Recognizing the Army's Cultural Changes," 13.

The evolution of ideas will change the inherent assumptions about how the culture operates. It is clear the assumption that the United States Army is a rigid hierarchy in a bureaucratic system is changing. The bureaucratic system will still be an effective means of control but will be augmented by the network, which works to flatten the organization. The flattening will bring about speed in which information is communicated to help in knowledge transformation. In order to harness the power of knowledge then the Army culture will need to identify more effective means of transferring knowledge among the force, not through the traditional formal hierarchical structures, but using the informal mechanism of communities of practice.

Communities of Practice

Etienne C. Wenger *et al.* in *Cultivating Communities of Practice* define communities of practice as "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interaction on an ongoing basis."[32] They further explain that these communities are nothing new and have been around since the dawn of time. The purpose of the communities is to manage knowledge. "Knowledge has become the key to success."[33] Wenger *et al.* note that knowledge is often confused with information. "Early attempts at knowledge management, however, were beholden to their origin in information technology."[34] Stored information does not equal knowledge; therefore knowledge management is broader than the systems that store information. Another key problem highlighted in traditional organizations is the structures are not conducive to knowledge being spread throughout the organization, just in limited teams, work groups, and sections.

[32] Etienne C. Wenger, Richard McDermott and William M. Snyder, *Cultivating Communities of Practice* (Boston, Mass.: Harvard Business Press, 2002), 4.

[33] Ibid., 6.

[34] Ibid., 8.

> Communities of practice are a natural part of organizational life. They will develop on their own and many will flourish, whether or not the organization recognizes them. Their health depends primarily on the voluntary engagement of their members and on the emergence of internal leadership.[35]

The communities are not a replacement to the work groups, teams, and sections but are a means to take information and practices in each of these elements and share them with other elements, to further understanding across the organization.

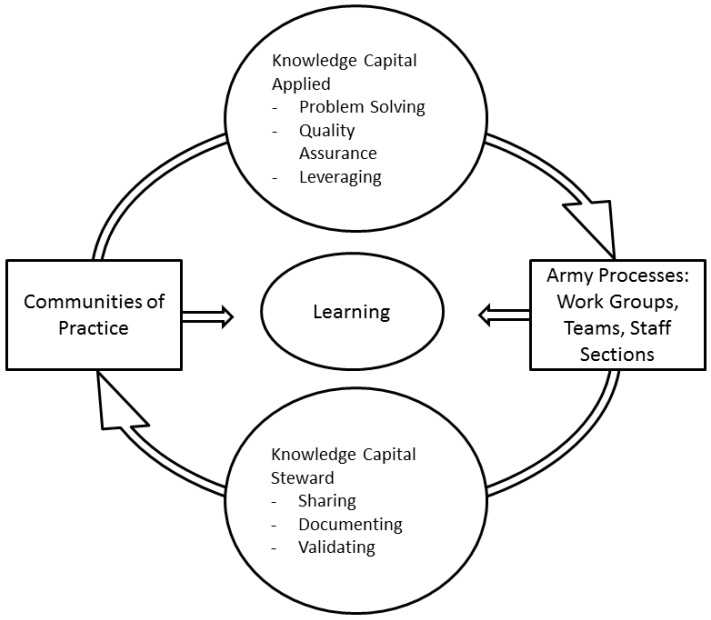

Figure 1. Adapted from Wenger's "The Multi-membership Learning Cycle"

The community of practice brings about a means to facilitate a structured, networked form of knowledge transfer. "A community of practice is a unique combination of three fundamental elements: a domain of knowledge, which defines a set of issues; a community of people who care about this domain; and the shared practice that they are developing to be effective in their domain."[36] Wenger *et al.* admit that work groups might share some of these characteristics, but the difference between them is that the community of practice is focused on the development of knowledge whereas a working group will be focused on delivering a

[35] Ibid., 12.

[36] Ibid., 27.

product.[37] Communities of practice facilitate situations where professionals can learn from each other, even when they find it difficult to articulate their knowledge. Therefore, communities of practice are an effective means of transferring tacit knowledge.

Finally, Wenger does highlight some problems with communities of practices. “They can hoard knowledge, limit innovation, and hold others hostage to expertise.”[38] Communities may not operate properly based on many reasons: pride, imperialism, narcissism, factionalism, cliques, egalitarianism, dependence, stratification, disconnectedness, localism, irrational politics, rigidity, complexity, and more.[39]

In order for the communities to be accepted and the knowledge effectively passed, the Army culture will need to become more flexible with the thoughts of capabilities and skill sets over the more traditional ranks and branches. The need to continue to exercise control will need to be tempered with an understanding of how the culture is changing and how best to integrate ideas such as communities of practice into the culture. Even if the exact nature of knowledge cannot be defined, knowledge provides the Army with competitive advantage, which is only realized when knowledge is shared.

[37] Ibid., 51.

[38] Ibid., 139.

[39] Ibid., 139-159.

United States Army Knowledge Management Doctrine

> Doctrine links theory, history, experimentation, and practice. Its objective is to foster initiative and creative thinking. Doctrine encapsulates a larger body of knowledge and experience.
>
> —United States Army, *FM 1-0*

Knowledge management doctrine is covered by four principle manuals in the United States Army: *FM 3-0 Operations*, *FM 5-0 The Operations Process*, *FM 6-0 Mission Command: Command and Control (C2) of Army Forces*, and *FM 6-01.1 Knowledge Management Section.* This section reviews the relevant sections of these manuals.

FM 3-0 Operations

FM 3-0 is one of two capstone documents of the United States Army and "provides the intellectual underpinnings that lie at the core of how our Army will organize, train, equip, and conduct operations…"[40] Knowledge management is covered briefly in chapter 7, starting at section 7-52. Knowledge management is defined as:

> The art of creating, organizing, applying and transferring knowledge to facilitate situational understanding and decision-making. Knowledge management supports improving organizational learning, innovation, and performances. Knowledge management processes ensure that knowledge products and services are relevant, accurate, timely and useable to commanders and decsionmakers.[41]

Knowledge management is broken down into three components: people, processes, and technology. People incorporates anyone who uses, processes, creates, or organizes the knowledge; essentially everyone. The processes are the "methods to create, capture, organize, and apply knowledge."[42] Finally, technology is all the systems that push and pull data that is used to store and display the knowledge products. The three components are run by the leaders of their organizations.

---

[40] U.S. Army, *FM 3-0 Operations* (Washington DC: U.S. Army, 2008), Forward.

[41] Ibid., 7-10.

[42] Ibid.

FM 3-0 directs leaders to understand the process of knowledge management and understand what capabilities are offered by the process. Knowledge management facilitates an effective transfer of knowledge to the commanders to make decisions, gain situational understanding, and coordinate the staff. The primary means of staff coordination with information and knowledge products are through the use of the Commander's Critical Information Requirements (CCIR): "The CCIR focus development of knowledge products."[43]

CCIR are an integral part of Army doctrine that facilitates understanding in the battle command process, they are a means for the commander to describe what has been understood and visualized. The information gathered using CCIR drive decision-making; however, CCIR firstly drive what information is collected and how that is turned into knowledge in order to facilitate understanding. Information that answers CCIR is termed relevant information. Relevant information is: "Providing the information commanders need to make decisions and maintain an accurate situational understanding requires staffs to understand the commander's intent and know the CCIRs."[44] Situational understanding is driven by knowledge about events and activities that are not predictable.

Situational understanding, according to *FM 3-0*, applies relevant information whereas situational awareness applies knowledge. Unfortunately, this contradicts the cognitive hierarchy in *FM 5-0* and *FM 6-0*, which is discussed below. According to the cognitive hierarchy, situational awareness leads to situational understanding and information leads to knowledge, ultimately facilitating understanding. To eliminate this confusion, situational understanding should be defined as applying knowledge, whereas situational awareness should be defined as applying relevant information.

[43] Ibid.

[44] Ibid., 7-12.

FM 5-0 The Operations Process

FM 5-0 "constitutes the Army's view on planning, preparing, executing, and assessing operations."[45] Knowledge management is one of the core concepts of command and control of operations. The aim of command and control is to enhance the commander's ability to make sound and timely decisions.[46] This section lays out the cognitive hierarchy that is described in further detail in *FM 6-0*. The cognitive hierarchy illustrates the transformation of data into understanding.[47]

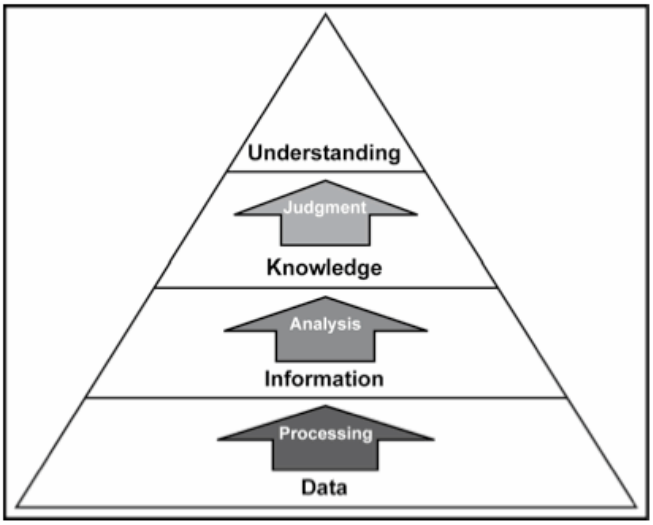

Figure 2. The Cognitive Hierarchy

Knowledge management facilitates many other elements in the operations process: collaboration throughout units, assisting in the design process, assisting in the current operations of the unit, and all other activities that require knowledge to generate understanding.[48]

[45] U.S. Army, *FM 5-0 The OperationsProcess* (Washington DC: U.S. Army, 2010), Preface.

[46] Ibid., 1-4.

[47] Ibid., 1-4.

[48] Ibid.

FM 6-0 Mission Command

FM 6-0 does not address knowledge management as a process; however it establishes a cognitive hierarchy for the flow of activities that lead to understanding. The first level is data: "*Data* is the lowest level of information on the cognitive hierarchy. Data consist of unprocessed signals communicated between any nodes in an information system, or sensings from the environment detected by a collector of any kind (human, mechanical, or electronic)."[49] The signals that move from location to location need something else to be useful. "Information is the meaning humans assign to data or the data that have been processed to provide further meaning."[50] The next step is knowledge: "information analyzed to provide meaning and value or evaluated as to implication for the operation. It is also comprehension gained through study, experience, practice, and human interaction that provides the basis for expertise and skilled judgement."[51] The fact that information is defined as meaning assigned to data, then knowledge is defined as meaning assigned to information, illustrates the difficulty doctrine has with making clear distinctions between information and knowledge.

The final step of the cognitive hierarchy is applying judgment to the knowledge leading to understanding; "understanding is knowledge that has been synthesized and had judgment applied to it in a specific situation to comprehend the situation's inner relationships."[52] Doctrine highlights understanding is knowledge that has synthesis and judgment, however, information must have had judgment applied to it already to have become knowledge. Again, there is an inconsistency in how doctrine distinguishes levels of the cognitive hierarchy.

Army doctrine uses information and knowledge interchangeably which leads to confusion. The confusion lies in how to delineate the differences in the terms. *FM 6-0* delineates

[49] U.S. Army, *FM 6-0 Missions Command* (Washington D.C., U.S. Army, 2003), B-1.

[50] Ibid.

[51] U.S. Army, *FM 6-01.1 Knowledge Management Section* (Washington D.C.: U.S. Army, 2008), Gossary.

[52] *FM 6-0 Mission Command,* B-2.

through the cognitive hierarchy that processed data leads to information, analysis of information leads to knowledge, and judgment applied to knowledge leads to understanding, then the application of these terms should be used properly throughout Army doctrine. Precise use of the terms will help alleviate confusion about what is expected when a commander requires information, knowledge, or understanding though processes such as CCIR, Commander's intent, essential elements of friendly information, situational awareness, and situational understanding.

FM 6-0 uses knowledge to illustrate concepts that have been previously covered, from command and control to situational awareness and understanding. This manual will not be explored further due to it being an old manual that is currently under revision to incorporate ideas such as knowledge management as a process and the evolving understanding of mission command in the Army.

FM 6-01.1 Knowledge Management Section

FM 6-01.1 is the explicit acknowledgement of knowledge management as a formal process that has been exercised in militaries implicitly from the beginning of organized warfare. The Army acknowledges that shared knowledge is power and this leads to the concept of mutual understanding outlined in *FM 6-0*. The manual breaks knowledge down into two categories: tacit and explicit knowledge. Explicit knowledge is defined by doctrine as:

> Explicit knowledge consists of written or otherwise documented knowledge in media that can be organized or stored, whether digital (such as computer files) or nondigital (such as paper). It is definite, openly stated, and often objective. Explicit knowledge lends itself to rules, limits, and precise meanings. It is easily collected, stored, and disseminated using information systems. Examples of explicit knowledge include field manuals, unit standing operating procedures, operation orders, and technical specifications or capabilities of equipment. During operations, this knowledge is created and applied to support understanding and decisionmaking.[53]

Implicit knowledge is defined by doctrine as:

[53] U.S. Army, *FM 6-01.1 Knowledge Management Section* (Washington D.C.: U.S. Army, 2008), 1-2.

> Tacit knowledge consists of comprehension gained through study, experience, practice, and human interaction. It resides in an individual's mind. All individuals have a unique, personal store of knowledge. They gain it from experiences, training, and informal networks of friends and professional acquaintances. However, individuals can also seek others' tacit knowledge to solve a problem or explore an opportunity. Intuition as discussed in FM 6-0 is an example of tacit knowledge. So is being able to understand the critical factors on which to focus in a complex situation. During operations, leaders are concerned with creating knowledge needed to accomplish the immediate mission. They also engage Soldiers' tacit knowledge to increase the unit's understanding. Knowledge from both sources help leaders make better decisions and conduct more effective operations.[54]

As discussed in the theory of knowledge, there is not one true definition of knowledge but it is important to understand how different types of knowledge can be utilized and where it can be found. The distinction between tacit and explicit knowledge also facilitates means to transfer knowledge from institutional learning for explicit knowledge, to human interaction and systems for tacit knowledge. Doctrine is not clear on how the tacit knowledge should be transferred because this is a human process, and is therefore much harder to codify into a prescriptive process. Fundamentally, tacit knowledge transfer is something one can describe but not fully understand how it is happening, which leads back to Polanyi's personal knowledge – knowing something is right or wrong but not fully knowing how or why.

FM 6-01.1 is broken down into three chapters: fundamentals; functions, duties, and responsibilities; and process and activities. This manual is applicable for echelons between brigade and corps. The processes outlined are supposed to be commander driven but there is an understanding that commanders will not have time to dedicate to this process and will delegate it to a knowledge manager. The knowledge manager then has the responsibility to prepare knowledge products, use the process of information management to process and store information and data, build the teams that allow for the collaboration of products within and outside of the

[54] Ibid.

organization, ultimately facilitating the commander with knowledge that will lead to understanding.[55]

Most of the issues raised above could be cleared up if the *FM 6-01.1* were to use the terms precisely as well as describe a process for how data leads to understanding. The manual describes many processes for analysis of data and information but does not illustrate methods to turn that information into knowledge and understanding. A concept of knowledge products is introduced but not defined or elaborated. Another concept the manual introduces is design and defines it: "design is identifying a KM product or service that effectively and efficiently answers a category of information requirements or meets the need for a specific knowledge category."[56] Unfortunately, the 2010 version of FM 5-0 defines design as "a methodology for applying critical and creative thinking to understand, visualize, and describe complex, ill-structured problems and develop approaches to solve them."[57] Finally, the manual lays out some concepts of what knowledge management is but then goes on throughout the rest of the manual to describe how to manage information, in other words information management.

Army Communities of Practice

> The goal of military knowledge transfer is very simple: Find those that have military experience and knowledge of value and transfer it as rapidly as possible to those who need it.
>
> —R. A. Dalton, *Knowledge Transfer for the Military Leader*

The United State Army has tried to develop communities that facilitate the sharing of knowledge. These communities are all centered on the idea of knowledge sharing. However, doctrine continually takes the knowledge management concepts and assigns them to information realms.

---

[55] Ibid.

[56] Ibid., 3-2.

[57] U.S. Army, *FM 5-0 The OperationsProcess* (Washington DC: U.S. Army, 2010), 3-1.

> Communities are groups of people sharing common concerns, problems, or professional interests. Individuals deepen their knowledge and expertise by regularly interacting with each other. Communities are a natural part of organizational life. These people may not work together every day; rather, they meet because they find value in the interactions. As they spend time together, members share information, insights, and advice. They help each other solve problems. They discuss situations, their aspirations, and their needs. Some communities create tools, standards, generic designs, and publications. Others simply develop tacit knowledge that they share. Members accumulate knowledge and, through this process, form ties based on learning together. Over time, they develop a perspective on the topic as well as a body of common knowledge, practices, and approaches. Members develop relationships and establish ways of interacting. Communities do not need technology to exist. They are completely social networks; however, technology has allowed communities to form without regard to members' locations. This has broadened their reach and made them more powerful and useful than ever before.[58]

The use of technology has allowed an expansion in the number of users able to gain knowledge through these communities. However, the key to communities is always human interaction and sharing tacit knowledge resident within people. Knowledge sharing is nothing new, but the uses of communities of practice help facilitate a more thorough understanding of domains of knowledge being examined.

Communities are formed when there is a domain of knowledge, willingness to participate, and a practice to share the knowledge. *FM 6-01.1* takes this idea and then further breaks down these communities into a hierarchical structure, further confusing a simple idea.

> Each virtual community has a life cycle and serves a specific purpose. Key to all Army communities are links to organizational objectives and a need for facilitated, managed conversations. Forums that lack these features (most informal networks) tend to focus on nonprofessional areas. The Army does not usually support informal networks. It does support the other types of communities shown in figure 3-2.[59]

[58] *FM 6-01.1 Knowledge Management Section*, 3-4.

[59] Ibid., 3-4.

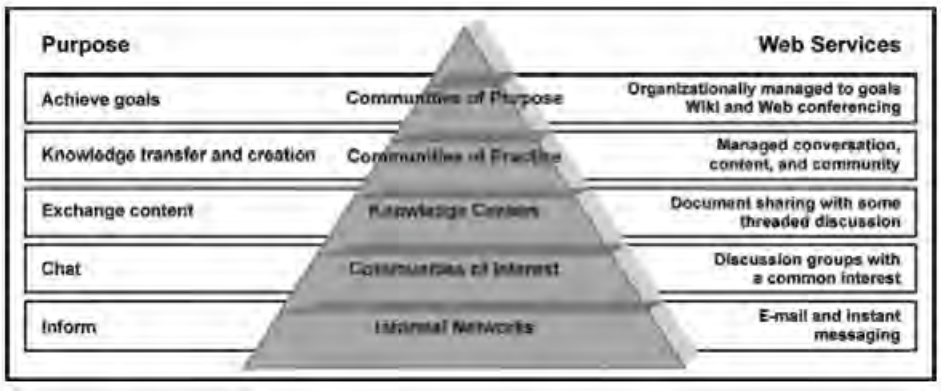

Figure 3. Virtual Communities (FM 6-01.1)

The informal networks are not a supported community but are a part of the virtual communities. Additionally, there are many communities, especially in operational theaters, that employ various form of Internet Relay Chat (IRC, mIRC, vIRC) to communicate and transmit knowledge. These are communities that meet the three fundamentals and are supported by the commands; therefore they are communities of practice. Breaking down the communities serves no added benefit for helping the spread of knowledge and introduces more terms that may not be accepted by the Army culture.

Another problem with this hierarchy is knowledge centers. The United States Army uses Army Knowledge Online as an example of a knowledge center.

> A knowledge center is a Web site where individuals share documents and engage in limited conversation concerning them. An AKO unit site is a good example of a knowledge center. The knowledge center may include additional collaborative tools as either links or add-on features. A knowledge center's purpose is to help people find or share documents related to the center's subject. There is no enduring bond between users other than as members of an organization or interest in the center's subject.[60]

AKO suffers from many of the problems highlighted by Wenger. The information and knowledge contained is difficult to find and access even if you know the information is there. The means by which information is stored is consistent with hoarding. To access knowledge on AKO requires a user to be accepted by multiple permissions. Additionally, most of the information and knowledge stored on AKO does not have a "wear out" date so information just keeps stacking up,

[60] Ibid.

further causing issues for people trying to gather information to facilitate their knowledge. Finally, the search function and the means to store knowledge once found is very difficult, making AKO a poor place to store knowledge.

The top of the hierarchy is communities of practice and the characteristics for this community are very limiting.

> A *community of purpose* is a group of people tasked to accomplish a specific objective. These communities' life span is usually limited to the time required to accomplish the objective. Communities of purpose are valuable for teams and working groups. They are usually hierarchically structured and provide for some level of managed conversation and document sharing.[61]

The point of a community is to develop knowledge whereas this community seems to be focused on a certain objective. The definition of a community of purpose is very similar to the doctrinal definition of a Working Group.

> An enduring or ad hoc organization within a joint force commander's headquarters formed around a specific function whose purpose is to provide analysis to users. The working group consists of a core functional group and other staff and component representatives.[62]

Communities of practice are developed to support working groups, teams, sections and other structures within the organization. Developing another type of community or trying to further break down communities seems to only confuse a simple concept.

FM 6-01.1 breaks down communities of practice under the concept of the virtual communities and defines it as:

> *Community of practice* refers to a group of people with a common interest who collaborate over an extended period to share ideas, find solutions, and build innovations. These groups are voluntary, self- organizing, and self-policing. They build a social network and develop bonds of trust deeper than those of other communities. Many organizations consider the benefits of communities of practice compelling enough to purchase the hardware and software necessary to create and maintain them. Communities of practice are widely seen as cost-effective ways develop organizational knowledge, create new knowledge, stimulate innovation, and share existing tacit knowledge.[63]

---

[61] Ibid., 3-6.

[62] Department of Defense, *JP 1-02 Department of Defense Dictionary of Military and Associated Term* (Washington D.C.: Department of Defense, Amended 2010), 505.

[63] *FM 6-01.1 Knowledge Management Section*, 3-5.

Notwithstanding that information technology and systems are an important element of knowledge management, it seems that doctrine continually makes them the most critical element. Communities are not created and maintained through the use of hardware and software; they are maintained by the interest of the participants (humans) in the domain of knowledge being practiced.

FM 6-01.1 illustrates the functional role of the communities: "Members of the community assist each other by sharing experiences, suggesting strategies, and exchanging information on community-related issues or projects."[64] The critical element of the sharing is the conversation or dialogue within the community. "The Army calls its supported and structured communities of practice *professional forums*."[65] These communities are congruent with Wenger's principles for designing a community of practice.

The Army functional forums and professional forums are being managed by the Army Operational Knowledge Management (AOKM) Community of Interest.

> A *community of interest* is a group of people who share a common interest or hobby. These people exchange ideas and thoughts about the subject but may know or care little about each other. Nonetheless, participation in a community of interest can be compelling and entertaining. Members may create a community to which they return frequently and remain for extended periods.[66]

The Army Operational Knowledge Management is an aggregate manager of many of the separate communities of practice (professional and functional forums) but is labeled as a community of interest. Aside from the AOKM being only a community of interest, the practice of bringing together all of the communities of practice under one site facilitates better understanding for the operating force. Personnel wishing to exchange knowledge will be able to go to the consolidated website to access the different professional and functional forums. The separate sites were great locations for knowledge but there had to be prior knowledge the site existed and where

[64] Ibid.

[65] Ibid.

[66] Ibid., 3-4.

those sites were located. As a result, individual communities were still stove piped entities that did not have effective means to share their knowledge. Individual practitioners will continue to populate the knowledge within separate communities; however, individuals seeking knowledge will now be able access the knowledge from one site as opposed to multiple sites.

Communities of practice will continue to grow based on the need to share information. The communities facilitate the need that has been caused by the command structure migrating from the traditional hierarchy to one of a mix between the hierarchical and a networked structure. Proper integration will require personnel to develop the sites, passionate participants to ensure applicable topics are discussed, and finally that the pertinent knowledge is captured and turned into explicit knowledge for future generations. Human interaction drives the process, not the network or systems facilitating the discussions. The ability to better enable interactions is the key to good knowledge management.

Business Practices

> In counterinsurgency, the side that learns and adapts the fastest gains important advantages.
>
> —General David Petraeus

Throughout history, there is a clear advantage to the force that can adapt and learn faster. Today's technology allows for information and knowledge to be transferred faster than it has in the past. The study reported in this section, conducted with senior field grade officers in the Army and executives from NUCOR steel, will highlight similarities in business practices and means to help implement better suggestions for policy for the United States Army Knowledge Management. The means by which the information was gathered was by conducting semi-structured interviews. For the Army, five field grade officers, all with operational experience in combat, were interviewed. For NUCOR industries, the chief executive officer and the equivalent of the chief information officer were interviewed. The intent of the interviews was to conduct a comparative analysis of military and civilian knowledge management practices to provide qualitative data that can inform improvements to current U.S. Army knowledge management policy and doctrine.

Army Leadership Insights into Knowledge Management

Throughout the interviews with field grade officers there was confusion about what knowledge management was. Except for one officer, the officers used information and knowledge management interchangeably. When speaking about knowledge management, the officers spoke about the information systems that were pushing or pulling the knowledge and information. The confusion stems from knowledge management not being understood and the lack of clarity provided about the subject from doctrine. As discussed previously, *FM 6-01.1* discusses knowledge management practices but only highlights information systems and technology in implementing knowledge management.

The focus on information systems and technology does provide a significant focus and insight. Every interviewed officer highlighted problems with their information systems and trying to find information, or the problem with information in those systems. The first critical problem was the inability to access information on the separate systems, even if a user knew that the information was present. Many policies have prevented practitioners from accessing the information based on permission restrictions, different levels of classification, and the inability to integrate with coalition partners.

The next issue was the information within the systems themselves. Information was only as good as it was inputted. Much of the information and knowledge was not useable because it was incomplete. COL_IN_2 stated that they would input information and get called asking if they knew about the information they just had inputted. LTC_AV (FAO) stated there was little time and not enough people to conduct analysis because of suspense time for reports. LTC_EN stated there was not enough time to synthesize the data so operators assumed risk based on limited understanding. Additionally, the speed and volume of information has not been managed well.

A means to gather information to facilitate knowledge is through the use of CCIR. The command has a need for knowledge. The knowledge will be gathered by asking the right questions. All the officers in the study used CCIR to help gather information and also the higher headquarters' CCIR to push information needed at higher levels. If the CCIR are done properly then the right questions will have been asked facilitating the proper information being received; however, the right questions are often not asked leading to a lack of or incorrect information. Analysis based on incomplete or incorrect information then leads to a lack of knowledge in specific areas.

Knowledge of specific areas is critical to understanding that area and it begins with asking the right questions. LTC(R)_AR stated that often the best experts of a given area are the first line leaders on the ground. The challenge is harnessing their tacit (personal) knowledge and getting that knowledge to the key leaders at the top. LTC(R)_AR's years of practice in the field of

knowledge management stated that the commanders must be able to issue their guidance and then be able to listen to what comes back up.

The knowledge that makes it to key leaders will be driven by need. LTC(R)_AR noted that there are different levels of knowledge management and compared it to cogs in a machine as follows. The knowledge management at the lowest levels spins very rapidly, in that the information will enter forums and communities of practice, be discussed and then there will be some kind of result for that information and knowledge. AOKM is the key proponent for this cog. Then AOKM and other similar communities will collate knowledge and send it to the Center for Army Lessons Learned (CALL) where key knowledge can be published in a publication or online. This cog will spin slower. The final cog will be the Combined Arms Doctrine Division (CADD). CADD takes the knowledge from forums, from CALL, and knowledge from leaders and others to generate the doctrine for the United States Army.

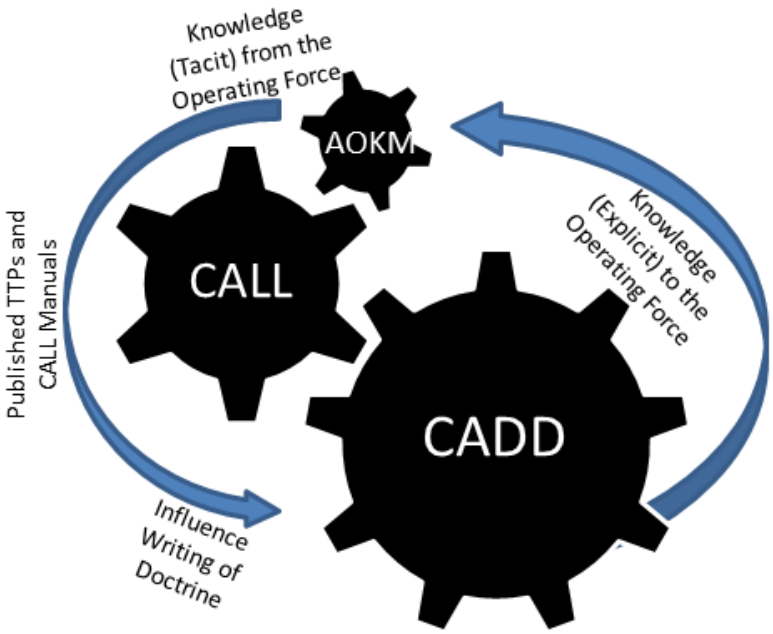

Figure 4. Knowledge Cogs

NUCOR Case Study

This case study is a direct result of interviewing the Chief Executive Officer Dan DiMicco, CEO of NUCOR since 2000, and the corporate information technology manager (equivalent to a Chief Information Officer), Scott Messenger. The purpose is to provide some insights on how a profitable business, with a large number of employees, spread throughout the country, generates and transfers knowledge.

Nucor steel is the largest domestic manufacturer of steel and steel products.

> Nucor Mission Statement: Nucor Corporation is made up of more than 21,000 teammates whose goal is to take care of our customers. We are accomplishing this by being the safest, highest quality, lowest cost, most productive and most profitable steel and steel products company in the world. We are committed to doing this while being cultural and environmental stewards in our communities where we live and work. We are succeeding by working together.[67]

The culture in Nucor ensures that everyone in the company understands what is expected of them and that it is a team effort. Teammates are what the Chief Executive Officer Dan DiMicco calls all the personnel who work for the company. This company has had over 130 consecutive profitable quarters. The success of the company is in the way the company is built.

There are only five levels from the newest person to the CEO of the corporation. This allows direct connections with the thought leaders and produces a coherent culture within the company. DiMicco stated that much of his industry did not succeed because of the entrenched bureaucracy involved in their companies. The company has no labor unions and employees have a stake in the company. If the employee's team and mill performs well they get compensated for that. DiMicco said the most important resource in the company is the people, employees not managers make the company run. So it is incumbent for Nucor to maintain a flat organization.

Much of the tacit knowledge is transferred by the leadership and since the organization is so flat this information gets to the lowest levels. The general managers at the plants are directly in

[67] Nucor, "Chapter 4: Mission," Nucor Corporation, http://www.nucor.com/story/chapter4/ (accessed January 2, 2011).

the middle of the hierarchy but they are also the lead person in their divisions. This person is integral in pushing the knowledge up and down. Nucor generally does not push out knowledge through some sort of information system; it is done by word of mouth.

A green sheet is a “word of mouth” method used by the company. The green sheet captures weekly knowledge from individuals, delineates what is relevant, and the quality of that knowledge. This sheet becomes a typical report that the executive vice presidents and CEO read. The green sheets further serve to prime the pump for questions to produce dialogue within the company. The dialogue facilitates knowledge acquisition and helps in the transfer of this knowledge throughout the company. All of this knowledge transfer relies very little on technology but relies on the culture and human interaction.

The use of technology, such as SharePoint, is used to augment the transfer of knowledge, not replace it. Technology is also used to connect similar communities within the company separated by distance. SharePoint is the primary means for which Nucor uses to transmit information within the communities, not email address lists. The communities also have formal policies about when information is stale (tombstone dates) and is available to be refreshed, removed, or destroyed in order to try to prevent flooding of bad information. Messenger made the analogy of information in a system as similar to items in a garage: it is a lot easier for stuff to get there than to clean it out.

Nucor “cleaned out the garage” by taking all the software within the company and evaluating it for use throughout the company, and then only took a specific few to use within the company. Nucor had too many applications or different software at the corporate level and got rid of many of them. Nucor realized that there were too many systems and there was no need to keep managing all the systems at a corporate level. Keeping only a select few systems allowed the users to understand how to use these systems and how to integrate those systems to facilitate knowledge transfer. Nucor has been successful because of the strong culture of leadership from

within the company and the ability for the lowest employee to be heard by their leadership. The culture depends on human interaction for the transfer of knowledge.

Comparison of Army and Corporate Knowledge Managment

The key to the success of NUCOR is their ability to remove the bureaucracy and a traditional hierarchy from the company. The company contains a method to pass information quickly from the top to the bottom with few levels in between for feedback and information to flow from the bottom up. Understandably, this is not an acceptable process for the Unites States Army based on the need for command and control (C2). C2 dictates a need for leaders at all levels. "The focus of C2 is the commander. Commanders assess the situation, make decisions, and direct actions."[68] The United States Army is structured for a commander at multiple levels of war from tactical to strategic to allow for understanding of the environment in which they fight but also an ease of command. "The most basic organization in control is a hierarchy. In Military terms, this relationship is between the commander and staff, and subordinate forces."[69] The most important aspect is the span of command and the size of the United States Army.

This hierarchy allows a force to be tailored to different situations, but also adds friction to information sharing, leading to a breakdown of knowledge formulation. Survivability and redundancy are critical in saving Soldiers' lives but have the negative effect of adding more layers in the command and control process that hinder the flow of information. Ultimately, all the command and control elements rely more on technology as the means to gain knowledge as opposed to being a tool to help humans interact to formulate knowledge.

In a theater of operations such as Iraq in 2009, if information flowed straight from the top to the bottom there were still nine to ten levels of command, and information does not flow straight down. It is intercepted at every level. If analysis was done at every level, then this

[68] *FM 6-0 Mission Command* , 1-2.

[69] *FM 6-0 Mission Command,* 3-6.

information would be valuable. However, this is rarely the case. The flow of information also relied on information systems to push that information instead of human interaction. NUCOR has been successful because of the need to push knowledge through human interaction with the use of technology tools, as opposed to relying on technology tools to hold and garner knowledge. COL_IN_2 stated that knowledge is built so that it is not supportive of a commander. “Rather than building a system that can follow the commander on the battlefield, we (commanders) have to go back to the headquarters to input the information. Knowledge management systems are built to support the commander only at their locations as opposed to where the leader is currently.”

The United States Army has taken steps to try to flatten the organization through modularity using information systems; however this again has put a reliance on the systems. If information is passed up and there is no analysis dedicated to the information then it will pass up and then come right back down in the same form. The lack of analysis also implies no synthesis occurs, which ensures there will be no real knowledge gained by the use of the information systems. A culture, as seen in NUCOR, that is not reliant on technology as the answer will be able to take information process it and turn it into knowledge that can be used by others. The United States Army has a good method to turn tacit knowledge into explicit knowledge. However, that method is reliant on technology and moves to slowly because of layers of bureaucracy.

Conclusion and Recommendations

> A commander-in-chief need not be a learned historian nor a pundit, but he must be familiar with the higher affairs of state and its innate policies; he must know current issues, questions under consideration, the leading personalities, and be able to form sound judgments. He need not be an acute observer of mankind or a subtle analyst of human character; but he must know the character, the habits of thought and action, and the special virtues and defects of the men whom he is to command…This type of knowledge cannot be forcibly produced by an apparatus of scientific formulas and mechanics; it can only be gained through a talent for judgment, and by the application of accurate judgment to the observation of man and matter.
>
> —Carl von Clausewitz, *On War*, "The Nature of Such Knowledge"

The speed at which information flows has forced the United States Army to change, implementing new concepts such as knowledge management throughout the force. However, a bureaucratic system that places many levels between the source of knowledge and who needs to know continues to hamper knowledge progress. The progress of the knowledge creates a condition of knowledge atrophy by the time that knowledge is formally codified into doctrine. This study recommends the United States Army continues to integrate processes such as communities of practice to facilitate a faster and more effective means of knowledge transfer. If knowledge is shared within a network structure, then the knowledge codified into doctrine will be more relevant, even though it is written through a bureaucratic system. The key to knowledge processes such as communities of practice is human interaction.

Human interaction, not systems, is the means by which knowledge is transferred. The key to understanding the difference in information and knowledge is having a clear distinction that is followed in doctrine. Knowledge, both tacit and explicit, is acquired as a human process and information is gained through technological means. Information can exist in isolation but knowledge requires a *knower*. Information management is driven by technology whereas knowledge management uses technology as a tool to facilitate the human process. Doctrine's utilization of information and knowledge will continue to cause confusion unless the terms are used with precision.

A means to help with the problem of precision is to fix the cognitive hierarchy. If the cognitive hierarchy clearly delineates how data moves through the levels to become understanding then this is simple graphical representation could create clarity in the terms. A way to clarify the distinction is to conceptualize the cognitive hierarchy in the following manner. If data is signals, then using analysis to breakdown the data will lead to information. Synthesis of the information, or applying judgment and justification, allows the information to be placed int the context of a greater whole, facilitating knowledge. Understanding develops from application of the knowledge to a specific context or situation, facilitating the situational and mutual understanding. Judgment must be applied in order for information to become knowledge therefore is not applied again to justify understanding.

Understanding will be fostered in knowledge management doctrine if there are less new terms introduced into the Army lexicon. The levels of communities are not helpful and have been shown to be used incorrectly within the knowledge management community. If the personnel who are implementing doctrine and the terms do not use them as prescribed in the manuals then others will not use them or understand them. Using the same word to mean multiple things will confuse and ensure the terminology is not accepted into the Army culture.

Information is data with meaning and the means to manage that information is through multiple systems that store the information for later use. These systems are called information systems and this is what is meant by information management. Knowledge management uses the people, process, and technology to process information into knowledge, facilitating understanding for the force. Knowledge management is a human process that uses technology as a tool, whereas information management is a technological process that employs technology to store and transfer data and information. Networks, information systems, army battle command systems, and many other technological systems are a means of storing and transferring information that will be used by humans to create knowledge. Knowledge management is not a specific technology or information system, it is a human process.

APPENDIX A: Acronyms

ASCOPE – Areas, Structures, Capabilities, Organizations, People, and Events

AKO – Army Knowledge Online

C2 – Command and Control

CCIR – Commander's Critical Information Requirements

CPOF – Command Post of the Future

BCKS – Battle Command Knowledge Systems

FRAGO – Fragmentary Order

IM – Information Management

KM – Knowledge Management

PMESII – Political, Military, Economic, Social, Infrastructure, and Information

TIGR – Tactical Ground Reporting

TTP – Tactics, Techniques, and Procedures

Appendix B: Oral Histories

Introduction:

The purpose of the interviews was to gain an appreciation of how information and knowledge can be used and focused on deployed operations. The interviews were approximately 10-20 minutes in length. The intent was to identify quantitative data that illustrates issues with knowledge management and the significance of those issues experienced in the field.

The format of the interview was structured around four main questions: 1. What quantity of information did you receive while deployed? 2. How did you deal with the amount of information received? 3. How did they process the information and turn it into knowledge and then intent? 4. What other insights or comments do you have on the subject of knowledge management? Each question had follow-on questions to clarify points and to highlight areas for the qualitative analysis.

Transcripts

Interview Summary #1: COL_IN_1

Interviewer: Sullivan, Patrick K; MAJ, US Army

SAMS Instructor, Commanded 2BN 7CAV, Planner and staff officer at BN, BDE, DIV levels

1. Massive amounts of information: patrol briefs, engagements with key leaders, information reports from different echelons of command, and many other items. More information than could be effectively processed. Looked at the information but not sure if they made sense of it all.

2. Analysis was conducted by the staff officers and tried to decide what was most pertinent to future missions.

3. Use of TIGRnet (IM) to track all the information that was coming in and transmitting to higher on CPOF (IM). The systems were only as good as the inputs put into them. Information inputted would be analyzed by the staff officers and then given to the commander.

Knowledge to Intent: Daily briefings with intelligence and information and then push the information back down to lower level leaders through daily intelligence updates and information reports. Daily FRAGOs to the lower commander for intent.

CCIR: Tried to use CCIR to drive collection of information…but just quantifiable enemy items were mentioned such as caches.

4. Biggest concern with knowledge management is the number of system that we utilize to control information and the interfacing issues. Lots of holes with lots of systems to talk to each other.

Interview Summary #2: COL_IN_2

Interviewer: Sullivan, Patrick K; MAJ, US Army

SAMS Instructor, Battalion Commander 1-15 Infantry, J5 United States military delegation to NATO, J5 Long Range Plans CENTCOM

1. Did not have that much information until the end of the rotation because of a new area and very little infrastructure and connectivity. At the end there was access to a high level of information. Only new information was coming from the company areas they were patrolling and working. Not much information coming from higher, providing information far exceeded what was received.

2. CCIR was tied to the weekly targeting process. Transmit more out than receiving.

3. The filter at which new information was received was tied to CCIR to provide intent and higher's CCIR. If the information was not directly tied to CCIR then it was looked at during the weekly targeting meeting.

RIP: Since it was a new area how did they capture the Knowledge for the gaining unit? Singular level: early working of personal contact of the future commander. Overt attempt to capture information with their SOP of CPOF to capture information. Recorded findings of areas inputted into CPOF. Created an extensive leader's recon and called it human terrain mapping. The point was not to bring in civilian experts but to develop a tangible TTP for tactical units to conduct patrols aimed at gathering information of a specific geographic location. PMESII ASCOPE was used as a way at looking at the area. Information was gathered by leader's eyes on the areas to develop how things looked. Used a standardized CPOF view for the selected areas. The information was only as good as the last guy.

4. The issues I have with information and/or knowledge management. There is always rivers of information flowing. Measuring requirements is difficult. The systems prospective: we have built architecture to the convenience to those providing the support. Rather than building a system that can follow the commander on the battlefield, we have to go back to the headquarters

to input the information. KM systems are built to support the commander only at their locations as opposed to where the leader is currently.

Information management in a COIN situation joke: Guy gets appointed to be a chief of an Indian tribe on a reservation. Elders ask if it is going to be a cold winter, because we will have to get to chopping wood. Chief says he will get back to them and asks the national weather agency if it will be a cold winter. The national weather center thinks it will be a cold winter. Tells the elders that it will be cold and so the tribe goes to chopping wood. The elders ask again and the chief asks the agency again and the agency again says yes it will be cold so the tribe continues to chop wood. Months go by and the winter is not cold so the elders ask again and the chief again calls the national weather service and they say hell yes man those Indians are chopping wood like crazy. Moral. Information is passed up and then passed back down without any analysis having been done to it and the units then are asked if they know that something is happening when that information was just passed up by that unit. Understanding the locations were interconnected was critical but it was difficult to get information from adjacent areas.

Interview Summary #3: LTC (R)_AR

Interviewer: Sullivan, Patrick K; MAJ, US Army

Chief of Operations for Center for Army Lessons Learned (CALL), Operations officer for Battle Command Knowledge Systems (BCKS), BCT S3, Command up through company, and staff levels to corps

1. Struggle to get the right information to the units above and below when in Al Anbar province. 2004-5 no knowledge of what BCKS was. Assume that BCKS was an IT type of organization. Challenge is to separate the signals from noise. Thirsty for knowledge, drowning in information. An example that is too much is Google.

2. Command responsibility to turn information into knowledge. Personality of the commanders of how the KM has been implemented in different units.

Drive the information using CCIR and ask the right questions. We have to ask the right questions and understanding that the knowledge of a given area resides in the young leaders on the ground. The challenge is to get the information from that young leader to key leaders at the top. Commander must be able to issue the guidance and then be able to listen that comes back up.

3. Understanding the commanders, higher, lower, and adjacent and their environments. Use of some IT means to harness the data to facilitate the knowledge. The technical aspect is what people tend to fall back on and is the easier than the knowledge resident with people (tacit knowledge). Role of the staff is to predict based on the information and knowledge coming from the Soldiers on the ground. Soldiers will gather knowledge based on missions and then share it and the challenge is how to capture that.

4. KM at the lowest level spins very rapidly. How to maintain the accuracy of the information being inputted in forums such as BCKS. The asynchronous dialogue about something posted will correct items posted or change the direction of it. CALL information turns a bit slower and has the ability to be analytical. An idea (knowledge object) will come in to CALL

from many locations then improve that knowledge and then publish it. Combined Arms Doctrine Division (CADD) turns very slowly because it publishes the doctrine. The knowledge from the operating force through CALL is harvest at CADD to become “gospel”. Each level is vital in knowledge for the Army. Knowledge object is that good idea that needs to shared between practitioners.

Interview Summary #4: LTC_AV (FAO)

Interviewer: Sullivan, Patrick K; MAJ, US Army

Army Aviation, Foreign Area Officer, Attended the Polish War College, ILE instructor, HUMINT for MNF-I

1. Flow of information in MNF-I was very high. Run searches and trying to filter data and information. Whatever was the priority became the priority for the teams. Command and DIA delineated what was priority. Support for task forces drove the intelligence collection and analysis. Too many CCIRs to use CCIR as a means to analyze information. Developing search criteria became a priority.

2. The knowledge was in the reports, information was turned into reports. Sources would give data and vetting that information was completely overwhelming. There were not enough people for the database that held the information from the sources. It was a part time job to analyze the reports for the analysts. There were not enough dedicated analysts for the information provided. Only good reports were used and pushed forward to a direct action teams. Another issue was cataloguing the reports. The tagging within the system was also flawed based on search criteria. There was no hierarchy for reports and no good means to get it to the target audience.

4. Part of the issues with coalition partners was the filters in the information systems. Information management with stove piped data. If you did not know the data was there then you would not know to look for it. If you are looking for a known then what about all the known. The field units would not get the data because of the classification of systems.

Interview Summary #5: LTC_EN

Interviewer: Sullivan, Patrick K; MAJ, US Army

Served as staff officer up to division, General's Aide, Command up to Battalion level, FUOPS at the Division

1. Information was at a moderate level. Future operations planner tried to picked through what important and relevant from the general officers. Listen to battle update assessments and battle update briefs and try to pick out the nuggets that were pertinent. Problem is getting all the data and pick through what you could and with quick suspenses deliver a report. There was not enough time to synthesize the data so you assumed risk based on limited understanding.

2. Dedicate to the process by immersing self in everything. Running estimates and keep the information in a book that was received. Using a binder turn it into a smart book. Have to have a big reference book and be able to synthesize the information to give to whoever was asking.

3. At the division levels there was never full understanding of the intent. Limited understanding prevented knowing the big picture. It was about presentation and showmanship over good staff work. Know what the boss wants to see and how they like it presented. Culling the data was like tap dancing to try to figure out what he wanted.

Develop standard templates and use other baseline things for people to be able to draw on. Series of slides on 1 page. In the scope of the brief here is what we can get across and once guidance was given then develop the roadmap (storyboard). Briefer must bring in someone else to take notes and then develop those notes into something.

4. Knowledge manager was more worried about information management and information systems. Use of the portal systems for staff processes. Use of standardized briefing rules was important. We don't use the right tools for the right application. The US Army is wedded to Microsoft office suite. We stovepipe information in using the Microsoft office items.

Army does not use the tools that we have downrange, in garrison. Too many systems and we are not collaborating. Generation gaps with something as simple as policy letters for Soldiers to be able to see them.

Interview Summary #6: Mr. Dan DiMicco

Interviewer: Sullivan, Patrick K; MAJ, US Army

Chief Executive Officer NUCOR

Mr. DiMicco has served as Chairman of Nucor since May 2006 and as President and Chief Executive Officer since September 2000. Previously, Mr. DiMicco served as Vice Chairman of Nucor from 2001 to 2006, Executive Vice President from 1999 to 2000 and Vice President from 1992 to 1999. He currently serves on the board of directors of Duke Energy Corporation. A metallurgist by training, Mr. DiMicco brings more than 35 years of steel industry experience to Nucor's Board, including serving as a member of several industry boards including the World Steel Association Board and Executive Committee, American Iron and Steel Institute (AISI), and as Chairman/Vice Chairman of the AISI. He also is a multi-year member of the Department of Commerce U.S. Manufacturing Council.

Since joining Nucor in November 1982, Mr. DiMicco has worked in a wide variety of roles at all levels of the Company, including nine years as Vice President of Nucor Corporation and President of Nucor-Yamato Steel Company (Limited Partnership), gaining a deep understanding of Nucor's operations and Nucor's unique organizational culture and values. Dan DiMicco is also the author of *Steeling America's Future: A CEO's Call to Arms, Saving Manufacturing Through Free Trade.*

Mr. DiMicco spoke about the company as a team and the employees within the company as teammates. This is reflected in their website of the employees of NUCOR are teammates. His emphasis of this team working as a cohesive whole sets it apart from many of the businesses they are in direct competition with. Mr. DiMicco was a football player while he attended Brown University. Leadership through the team is the means by which Mr. DiMicco communicates with his company.

Following his college years, Mr. DiMicco was part of a failed steel business where he realized the faults and inherent issues of bureaucracies. The problems of too many layers and layers outside of the chain of command, such as unions, led to multiple problems in that company. This understanding allowed Mr. DiMicco to realize what issues he needed to address when he became a plant manager. He always put his people first and understood what that meant for the business.

The people or human interaction is how knowledge is transferred inside of Nucor. Mr. DiMicco highlighted how there is only 5 levels from him to the newest employee in the company with only three levels from the newest employee to the plant manager. He speaks directly to plant managers weekly. He uses technology to facilitate the meetings but does not expect the technology to hold the knowledge or facilitate knowledge. The ease and flow of information allows the information to go down quickly and feedback will come back quickly.

Successful organization have an effective culture, and assuming that culture works you must have people compatible to that culture. People are not the most important resource, the right people are the most important resource. The people make up the culture that makes the culture successful. Mr. DiMicco continually highlighted quality of people acquired and the need to grow the proper people in the proper roles. Most important is identifying the people with the “can do” attitude that have the drive to succeed and not settling for something below the standard because of not enough time or whatever negative factors. Throughout the interview Mr. DiMicco stressed the importance of people and how those people create and pass on the knowledge to be successful.

Interview Summary #7: Mr. Scott Messenger

Interviewer: Sullivan, Patrick K; MAJ, US Army

Corporate Information Technology Manager (same as a Corporate Information Officer)

Nucor is the largest manufacturer of steel. Nucor has bought up many failing companies and became a maker of steel products and acquirer of steel companies. The companies make, recycle scrap, and build steel products. The company has grown in the last two decades to be the size that it is today. Much of the Nucor leadership has been with the company since the drive to expand the company.

This leads to a continuity leading to a culture understanding of how the company operates. This culture was pushed through what Mr. Messenger calls “camp fire stories”. The knowledge of the company was pushed by word of mouth from the leadership to the employees. The company did have growing pains going from 5000 to 20,000 people. The solution was to carry on with the concept of the “camp fire story” but expanded to push the knowledge by way of the management teams which directly work with the CEO of Nucor. Each plant has a general manager that directly interacts with a vice president at the corporate level, and the knowledge of what is important to Nucor is directly passed from CEO to the General Manager.

Every general manager is supposed to understand know the people first and foremost. This facilitates the culture exchange and knowledge management for understanding. The knowledge gleamed is not pushed through a computer system. The knowledge is put into something called a green sheet that recaps everything gathered throughout the week. The green sheet directly shows where profit is and what the issues are. People bonuses are directly tied to their performance. Safety is critical to protecting the people.

The green sheet knowledge is something that all personnel within a mill have to understand. The green sheets serve to prime the pump for better communication. They are the means by which dialogue happens within the company. The general managers meet face to face

with the CEO three times a year. The communication cycle relies very little on technology, except for simple message through email.

Nucor says that if I knew how to do your job I would not need you. This statement drives the teammates to improve what they are doing and do things better. This led to a better means of collaboration within the company to push knowledge back and forth. This also allows for a better sharing of great techniques and procedures. This drive was because of an understanding of the limits of email. The company went with SharePoint. The CEO re-iterated that the collaborative systems were not a means to push knowledge and information but as a means to augment the lines of communication. The collaborative process pushed the forming of separate communities.

The communities were self organized by people who wanted to make a difference. The underpinning principles in the communities were based on ideas and formed the central items there. The communities span the company from different divisions. The systems were designed to retain information in a central location so that others could reach out and pull that information to formulate knowledge. All information in the system is tagged with a wear out date (tombstone date) when the information should be destroyed. Documents are managed by who created it and then who updated the documents. Putting things in the garage is easier than taking them out. The information is usually not destroyed but is put into an archival status, still available but not posted as active content.

Nucor suffered from to many systems and products when they expanded. Each plant and manager had software that they wanted and kept. The company then identified what items would be run throughout the company to facilitate information across the company. Once the software was streamlined created clarity and allowed Nucor to work together, which broke down each division competing with each other to say they could build a better “mousetrap” than the other.

BIBLIOGRAPHY

Anastas, Kevin P. “Information Overload: Tactical Processing in Divisions and Corps.” Monograph, School of Advanced Military Studies (SAMS), Fort Leavenworth: U.S. ARMY CGSC, 1992.

Audi, Robert. Epistemology: A Contemporary Introduction to the Theory of Knowledge (Routledge Contemporary Introductions to Philosophy). London: Routledge, 1997.

Awad, Elias M, and Hassan M. Ghaziri. Knowledge Management. United States ed ed. Upper Saddle River, N.J.: Prentice Hall, 2003.

Barton, Lieutenant Colonel James. “The Army Battle Command System: Fixing the Stovepipe.” Information Technology, Websters University, Fort Leavenworth: Websters University, 2005.

Brooks, Catherine F. 2010. "Toward 'hybridised' faculty development for the twenty-first century: blending online communities of practice and face-to-face meetings in instructional and professional support programmes." *Innovations in Education & Teaching International* 47, no. 3: 261-270. *Academic Search Complete*, EBSCO*host* (accessed December 20, 2010).

Brown, John and Duguid, Paul. *The Social Life of Information.* Boston, Massachusetts: Harvard Business School Press, 2000.

Clausewitz, Carl Von. *On War*. Princeton, NJ: Princeton University Press, 1976.

Dacus, Andrew P. “Impact of C4ISR/Digitization and Joint Force Ability to Conduct the Global War on Terror.” Monograph, School of Advanced Military Studies, Fort Leavenworth: U.S. ARMY CGSC, 2006.

Dichiro, Joseph J. “The Impacts of Digitization on the Army's Decision Making Process.” Master's Thesis, U.S. Army Command and General Staff College, Fort Leavenworth: U.S. CGSC, 1997.

DiMicco, Dan. *Steeling America's Future*. Charlotte, NC: Vox Populi Publishers, LLC, 2006.

Hatch, Mary Jo. Organization Theory: Modern, Symbolic, and Postmodern Perspectives. 2 ed. New York: Oxford University Press, USA, 2006.

Hislop, Donald. Knowledge Management in Organizations. 2 ed. Oxford: Oxford University Press, USA, 2009.

Kilner, Peter. 2002. "Transforming Army Learning Through Communities of Practice." *Military Review* 82, no. 3: 21. *MasterFILE Premier*, EBSCO*host* (accessed December 20, 2010).

Leahy, Kevin C. “The Impact of Technology on the Command Control and Organizational Structure of Insurgent Groups.” Master's Thesis, U.S. Army Command and General Staff College, Fort Leavenworth: U.S. CGSC, 2005.

Lim, Lieutenant Colonel Howard. “Knowledge Management at MNC-I.” *Trends, Challenges, and Opportunities.* Baghdad, 2008 October.

Lynch, Kevin R. “Army Digital Systems Complexity.” Monograph, School of Advanced Military Studies (SAMS), Fort Leavenworth: SAMS, 2008.

Meyerowich, Drew R. “Typewriter Leadership in a Facebook World.” Monograph, School of Advanced Military Studies (SAMS), Fort Leavenworth: U.S. ARMY CGSC, 2009.

Murray, Williamson, and Allan R. Millett. *Military Innovation in the Interwar Period.* New York, NY: Cambridge University Press, 1996.

Nucor. “Chapter 4: Mission.” Nucor Corporation. http://www.nucor.com/story/chapter4/ (accessed January 2, 2011).

Ouchi, William G., and Raymond L. Price. “Hierarchies, Clans, and Theory Z: A New Perspective On Organization Development.” Organization Dynamics 7, no. 2 (1978): 36. http://www.ebscohost.com (accessed December 9, 2010).

Pennington, Robin, and Brad Tuttle. “The Effects of Information Overload on Software Project Risk Assessment.” *Decision Sciences* (Decision Science Institute) Volume 38, no. 3 (August 2007).

Perry, Walter L, and James Moffat. *Information Sharing Among Military Headquarters.* Santa Monica, CA: Rand Corporation, 2004.

Petreus, David. “Multi-National Force-Iraq Commander's Counterinsurgency Guidance.” *Military Review* (October 31, 2008): 1-4. http://usacac.army.mil/CAC2/MilitaryReview/Archives/English/MilitaryReview_20081031_art004.pdf (accessed January 3, 2011).

Plato, translated by: Benjamin Jowett. “Theaetetus.” MIT. http://classics.mit.edu/Plato/theatu/html (accessed February 21, 2011).

Polanyi, Michael. “Knowing and Being.” Mind 70, no. 280 (October 1961): 468.

Price, Richard. “Impact of Information Technology - For Strategic Leaders.” Strategy Research Project, Carlisle, PA: U.S. Army War College, 2007, 19.

Ropes, Donald, and Jürg Thölke. 2010. "Communities of Practice: Finally a Link Between Individual and Organizational Learning in Management Development Programs." *Proceedings of the European Conference on Intellectual Capital* 504-512. *Business Source Complete*, EBSCO*host* (accessed December 20, 2010).

Schein, Edgar H. Organizational Culture and Leadership (J-B US non-Franchise Leadership). 3 ed. San Francisco: Jossey-Bass, 2004.

Schön, Donald A. Educating the Reflective Practitioner. San Francisco: Jossey-Bass, 1990.

Seaman, Mark. 2008. "BIRDS OF A FEATHER? COMMUNITIES OF PRACTICE AND KNOWLEDGE COMMUNITIES." *Curriculum & Teaching Dialogue* 10, no. 1/2: 269-279. *Academic Search Complete*, EBSCO*host* (accessed December 20, 2010).

Smith, Chris R. "Network Centric Warfare, Command, and the Nature of War." Monograph, School of Advanced Military Studies (SAMS), Fort Leavenworth: U.S. ARMY CGSC, 2009.

Steup, Matthias, "Epistemology", *The Stanford Encyclopedia of Philosophy (Spring 2010 Edition)*, Edward N. Zalta (ed.), http://plato.stanford.edu/archives/spr2010/entries/epistemology (accessed October 23, 2010).

Taleb, Nassim. *The Black Swan.* New York, NY: Random House Inc, 2007.

U.S. Army. *FM 3-0 Operations.* Washington DC: U.S. Army, 2008.
——. *FM 5-0 The Operations Process.* Washington, DC: U.S. Army, 2010.
——. FM 6-0 *Mission Command: Command and Control of Army Forces*. Washington, DC: U.S. Army, 2003.
——. *FM 6-01.1 Knowledge Management.* Washington, DC: U.S. Army, 2008.
——.*FM 7-0 Full SpectrumTraining.* Washington, DC: U.S. Army, 2020.

U.S. Strategic Command. *The Collaborator.* U.S. Stratcom, 2008.

Weber, Max. *Economy and Society: An Outline of Interpretive Sociology (2 volume set)*. Edited by Guenther Roth and Claus Wittich. Berkeley: University of California Press, 1978.

Wenger, Etienne, Richard McDermott, and William M. Snyder. *Cultivating Communities of Practice*. Boston, Mass.: Harvard Business Press, 2002.